

## **REMARKS/ARGUMENTS**

In the Office Action, the Examiner rejected claims 1-3, 5-7, 15-17, 19-22, 25, 26, and 29-34 under 35 U.S.C. 103(a) as being unpatentable over some combination of *Frankeny et al.* (US Pat. 5,691,041), *Card, Jr. et al.* (US Pat. 5300402), *Ohshima et al.* (US Pat. 5,936,843), *Love* (US Pat. 5,477,160), *Wang et al.* (US Pat. 6,081,026), *Akagawa et al.* (US Pat. 5,834,844), and *Mizuno et al.* (US Pat. 6,077,757). The rejections are fully traversed below. Reconsideration of the application is respectfully requested based on the following remarks.

Claims 1 and 15 have been amended. Specifically, the limitation of “single-layer” has been added. Support for the amendments may be found in the Specification on page 10, lines 14-16, page 14, line 27, and elsewhere. Accordingly, claims 1-3, 5-7, 15-17, 19-22, 25, 26, and 29-34 remain pending in this application.

### **REJECTION OF CLAIMS UNDER 35 U.S.C. §103(a)**

The invention as set forth in independent claim 1 generally relates to an integrated circuit package. Specifically, independent claim 1 requires among other things “a single-layer solid flexible dielectric circuit film having a thickness of 10,000 to 200,000 Angstroms.” The invention as set forth in independent claim 15 generally relates to an integrated circuit wafer. Specifically, independent claim 15 also requires among other things “a single-layer solid flexible dielectric circuit film having a thickness of 10,000 to 200,000 Angstroms.”

One of the many advantages of having this single-layer solid flexible dielectric circuit film (FDCF) in the manner claimed is that it provides a highly compliant interconnection between the die and another substrate. Generally, in reference to FIGS. 4 and 5, the combination of the offset contact structure on the single-layer solid FDCF and the air gap (e.g., 414; 514) formed between the die and the FDCF absorbs stresses by allowing the contact bumps (e.g., 422; 522) on the FDCF to move inward into the air gap without damaging the die. In this way, the flexing of the FDCF into the air gap decouples some stresses that might otherwise be transferred in a rigid underfill layer or semi-rigid interposer layer located between the contact bumps and the die. (See page 10, lines 22-29) The implementation of a single-layer solid FDCF having a thickness of 10,000 to 200,000 Angstroms (i.e., 0.001 mm to 0.02 mm) further increases these advantages. This is because a single-layer solid FDCF typically provides more flexibility than a multitude of single-layers stacked together as in a multiple-layer solid FDCF. This is also because a thinner FDCF typically provides more flexibility than thicker FDCFs. As such, the

solid FDCF will be allowed to flex even more into the air gap; thereby, further decoupling the aforementioned stresses.

In contrast, the cited references lack the advantages of the present invention. *Frankeny et al.* merely discloses body 4 of interposer 3 having a thickness of 0.05 mm to 0.5 mm. (See Column 4, Lines 6-9) *Ohshima et al.* merely discloses using methods of manufacturing printed wiring boards for fabricating the terminal density conversion board 50 and has no references to its thickness. (See Column 5, Lines 39-41) Likewise, *Love* merely discloses using conventional printed circuit board techniques for forming test substrate 103 and also has no references to its thickness. (See Column 4, Lines 29-34) *Wang et al.* merely discloses a dielectric layer 110 having a thickness of 25 to 50 microns (i.e., 0.025 mm to 0.05 mm). (See Column 3, Line 61) *Mizuno et al.* merely discloses an insulating substrate 18 having a thickness of 100 microns (i.e., 0.1 mm) Finally, *Akagawa et al.* doesn't even disclose any type of FDCF at all. The cited references disclose only a relatively thick FDCF and fail to teach or suggest having an extremely thin FDCF with a thickness in the range of 10,000 to 200,000 Angstroms.

The Examiner states that "*Frankeny et al.* further teach the FDCF/interposer being formed of a variety of polymer coatings/formulations/films for different applications (Col. 5, lines 26-40), such polymer having a thickness as low as 0.5 mils or 125 angstroms as taught by *Card, Jr. et al.*" However, in that cited portion, *Frankeny et al.* explicitly states that the "polymers are available for forming multilayer interposer structures." Therefore, even though *Card, Jr. et al.* may disclose such polymer having a thickness as low as 0.5 mils or 125 angstroms, the polymer is only available to form multilayer interposer structures. Moreover, as viewed in the whole context of *Frankeny et al.*, the multilayer interposer structures would still each have a body 4 thickness of 0.05mm to 0.5mm. (See Column 4, Lines 6-9; FIG. 2)

In view of the above, it is respectfully submitted that *Frankeny et al.*, *Card, Jr. et al.*, *Ohshima et al.*, *Love*, *Akagawa et al.*, *Mizuno et al.* or *Wang et al.*, alone or in combination, do not teach or suggest claims 1 and 15. Furthermore, there is no suggestion or motivation to combine the references to obtain claims 1 and 15. For example, in view of the above, *Frankeny et al.* explicitly teaches away from using the polymers disclosed in *Card, Jr. et al.* in forming a single-layer solid FDCF as claimed. Therefore, it is submitted that claims 1 and 15 are patentable over the cited references.

Claims 2-3, 5-7, 16-17, 19-22, 25, 26, and 29-34 each depend either directly or indirectly from independent claims 1 and 15 and are therefore respectfully submitted to be patentable over

the art of record for at least the reasons set forth above with respect to the independent claims 1 and 15. Additionally, these dependent claims require additional elements that when taken in the context of the claimed invention as a whole, further patentably distinguishes the art of record.

### **SUMMARY**

It is respectfully submitted that all pending claims are allowable and that this case is now in condition for allowance. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

If any additional fees are due in connection with the filing of this Amendment, the Commissioner is authorized to deduct such fees from the undersigned's Deposit Account No. 500388 (Order No. NSC1P181).

Respectfully submitted,  
BEYER WEAVER & THOMAS, LLP



Desmund Gean  
Reg. No. 52,937

BEYER WEAVER & THOMAS, LLP  
P.O. Box 778  
Berkeley, CA 94704-0778

Telephone: (510) 843-6200  
Facsimile: (510) 843-6203